CONHECIMENTO & DIVERSIDADE
ISSN 2237-8049
UnilaSalle Editora

WRITING EDUCATIONAL GAMES: A LITERATURE REVIEW WITH AN ALTERNATIVE INSTRUCTIONAL APPROACH

ESCREVENDO JOGOS EDUCACIONAIS: UMA REVISÃO BIBLIOGRÁFICA COM ABORDAGEM INSTRUCIONAL ALTERNATIVA

Daniel Mill
Universidade Federal de São Carlos
Brasil
Email: mill@ead.ufscar.br

Priscila Andreoni Ribeiro
Universidade Federal de São Carlos
Brasil
Email: andreonipriscila@gmail.com

Braian Veloso
Universidade Federal de São Carlos
Brasil
Email: braiangarritoveloso@gmail.com

ABSTRACT

This article explores the writing of educational games, outlining the key elements of games and their methodologies for selecting educational content. The aim is to consider how to write educational games, utilizing a literature review methodology. The instructional approaches, traditional and alternative, form a polarized narrative, leading to reflection on the best way to adapt educational games to the curriculum. The traditional approach teaches the elaboration of instructional objectives before the design of educational games. The alternative approach proposes a storytelling-based model for selecting instructional content. Stories are created by emotional conflicts and interests, using these conflicts to create a narrative of antagonists favors engagement and meaningful learning. Appropriate technical tools employed in the creation of educational games should always be studied, aiming at the efficiency of game design and the effectiveness of learning. The main conclusion of this work is that the traditional and alternative approaches are not antagonistic, and both can be integrated in the writing of educational digital games.

Keywords: Writing educational games. Active Methodologies. Gameplay.

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RESUMO

Este artigo trata da escrita de jogos educacionais, percorrendo os principais elementos de jogos e suas metodologias de seleção de conteúdo educacional. O objetivo principal é de refletir sobre como se escreve jogos educacionais, pela metodologia de revisão bibliográfica. As abordagens instrucionais, tradicional e alternativa, formam uma narrativa polarizada, conduzindo à reflexão sobre a melhor forma de adequar jogos educativos ao currículo. A abordagem tradicional ensina a elaboração de objetivos instrucionais antes do desenho dos jogos educacionais. A abordagem alternativa propõe um modelo baseado em contação de estórias para a seleção de conteúdo instrucional. Estórias são criadas por conflitos emocionais e de interesses, utilizar estes conflitos para criar uma narrativa de antagônicos favorece o engajamento e aprendizagem significativa. Ferramentas técnicas adequadas empregadas na criação de jogos educacionais devem ser sempre estudadas visando à eficiência do desenho de jogos e a eficácia da aprendizagem. A principal conclusão deste trabalho é que as abordagens tradicional e alternativa não são antagônicas e ambas podem ser incorporadas na escrita de jogos digitais educacionais.

Palavras-chave: Escrita de jogos educacionais. Metodologias Ativas. Jogabilidade.

Introduction

Digital games, also known as “games”, have been utilized in the field of psychopedagogy primarily to encourage and enhance cognitive, emotional, and physical abilities in their users. Psychopedagogical research has demonstrated that it is feasible to restore a pleasurable relationship with learning and studying through game-based interventions specifically designed for this purpose. The use of games for educational purposes is not a new concept, as in the past they were commonly referred to as “simulations”. Nowadays, games as a form of entertainment have become ubiquitous in people's lives, and there is a growing interest in utilizing digital games for purposes beyond entertainment. However, there are concerns regarding the effectiveness of educational games in promoting quality learning. According to Gee (2007), one of the key principles for games to facilitate active learning is that they must be developed with a strong pedagogical foundation. He asserts that not all educational games promote learning, but only those that are designed with the objective of facilitating meaningful and enjoyable learning. Therefore, the design of educational games is crucial in achieving solid educational outcomes.

According to Fredricks (2004), involvement is a crucial element in the advancement of education and scholastic success. Fredricks identifies a multi-

faceted approach to involvement, which includes behavioral, emotional, and cognitive engagement. These three aspects of involvement include attentiveness, immersion, presence, and the sensation of flow (a feeling of enjoyment resulting from the activity). These dimensions of involvement are interrelated and determine the level of association with the game and the positive consequence in terms of education.

Dille (2007) makes a distinction between the individuals who design a game and those who write it. It is evident that the game designer is akin to a film director, overseeing all aspects of gameplay. However, the game writer is responsible for constructing the game's storyline and its correlation with the gameplay. With the rise of independent games in the gaming industry, where small teams or individuals create games without a company's backing, the roles of game design and writing tend to merge. In educational games, teachers often undertake the role of game writers, since they are responsible for developing educational content. Nowadays, the instructional designer shares the responsibility of creating educational content with the teacher, mainly in distance education.

Da Rosa (2020) conducted research on the integration of digital games into the teaching practices of basic education instructors, higher education scholars, and pedagogy students. The study highlights that games are perceived as a viable means of facilitating learning within the classroom. Nevertheless, educators encounter significant obstacles in selecting appropriate games, identifying their unique features, and effectively integrating them into their lesson plans, ultimately leading to the underutilization of educational digital games in schools.

Recognizing that digital games are created with the intention of offering valuable and captivating education, the central inquiry of this article arises: How can educational games be written to promote effective and enjoyable learning? For game developers and designers, this question is exceedingly significant, as it determines the efficacy of learning and its correlation with enjoyment and immersion. The selection criteria for bibliographic material were texts containing synonyms such as creating educational games, serious games, or writing educational games. No material written in Portuguese was discovered on this topic.

Using the bibliographic review method, both a conventional design model and a script for writing educational games, as well as an innovative approach, will be evaluated in this study. Finally, some reflections on techniques and tools for writing educational games will be presented.

Fundamentals of Educational Games

The significance of imagination in education has been extensively researched. As per Jackson (2018), realistic imagination bridges the gap and broadens the disparity between the familiar and the unfamiliar. Imagination aids in comprehending the logicality of concepts through observation, deduction, conjecture, trial, and unstructured activity.

It is unavoidable to ponder over the significance of education and the expedition to explore the uncharted. There are numerous perspectives on the role of education in contemporary society and, as a result, on the construction of the syllabus. As per Eisner (2005, p. 18), the fundamental principle of the syllabus is that "education readies individuals for life and, consequently, for carrying out specific duties necessary for their survival." The knowledge essential for survival consists of abilities, customs, and values, which together form the educational aims, with the curriculum being a sequence of experiences that lead to attaining these objectives. This topic will be examined in greater depth while discussing the conventional approach to developing an educational program.

When delving into educational games, we explore the instructional and artistic aspects of games, along with their interactivity. While the definition of educational goals, as per Eisner (2005a), is crucial for the instructional aspect, it serves as a foundation for game design.

Commencing with the attributes of an educational game that facilitate meaningful learning, Bedwell (2012) enumerates nine primary features: action language, appraisal, opposition/challenge, authority, milieu/circumstances, game narrative, interpersonal communication, engagement, and regulations/objectives. To elaborate further, action language pertains to the game's communication protocols, including the feasible modes of interaction and user interface. Appraisal

encompasses all the responses given to the player, such as ratings and advancement indicators. Opposition/challenge refers to the predicament presented in the game and its type. Authority denotes the degree of interaction and autonomy the player has in the game. The milieu, or the game realm, signifies the context in which the problem is introduced. Game narrative is the category of the game and the tale that is narrated by the game. Interpersonal communication indicates the interactions between players during the game. Engagement is the player's emotional connection with the game's story. And regulations/objectives represent the opportunities for action to accomplish the game's objective.

The identical writer lists the subsequent information as desired learning consequences: intellectual (including cognitive tactics and declarative understanding), abilities (psychomotor and adjustment), and emotional (internalization of values and drive).

A significant reason for the attention in utilizing games in education is the emotional and social commitment they can offer to the subject. According to Oksanen (2017), games created to enhance players' emotional and social processes establish a more substantial foundation for effective social engagement, co-constructing knowledge. The educational game's collaborative learning environment is the crucial factor in creating a productive emotional and social interaction through pedagogical strategies.

Dreon (2017, p. 275) delves deeper into the design aspects of educational games and highlights the following key points:

> 1) Familiarize yourself with your audience: Understand the prior knowledge of the user group and select resources accordingly.
> 2) Emphasize learning: The selection of game elements should align with the learning objectives of the activity.
> 3) Accommodate different skill levels: The design of educational games should enable participants to explore various stages of the game based on their skill level. Some may prefer more social interaction, while others may prefer more access to instructional content.
> 4) Infuse fun into the game: Game challenges should be designed to fulfill instructional objectives while also being entertaining.
> 5) Foster inclusivity: Incorporating diverse perspectives not only provides varying viewpoints, but also sparks interest and promotes the formation of a supportive community.
> 6) Build community: Balancing competition and collaboration will encourage players to support each other's success. (our translation)

Contemplating the creation of an educational game leads to a discussion about the game's storyline. Travis (2010) proposes that storytelling, games, literature, and other forms of media should be considered as a subset of a more extensive narrative, encompassing all performances that occur within the context of the spectator-narrative relationship. This idea is crucial as it defines narrative as the outcome of the interaction between the educator and the student, allowing educators to establish learning environments that are centered around narratives. By utilizing a narrative anchor, educators can engage in a dialogue with their students, bridging the gap between academic knowledge and real-world activities. The primary challenge for educators today is to leverage this comprehensive definition of storytelling to enhance learning through games.

Teixeira at Salen and Zimmerman (2012, p. 263) provide another interpretation of narrative, which involves "immersing oneself in a world of narrative representations where players can engage in meaningful playful interaction by manipulating and exploring their surroundings." They distinguish between two types of narratives in games: embedded and emergent. Embedded narratives are pre-organized before player interaction, while emergent narratives arise from player interactions and resulting transformations. To ensure an engaging narrative, they identify nine fundamental principles: objectives, conflicts, uncertainty, basic mechanics, narrative space, narrative descriptor, narrative system, cutscenes, and retelling the game's story.

Based on these principles, it is worthwhile delving deeper into the concepts of fundamental mechanics and non-interactive sequences. Fundamental mechanics refer to the actions that occur within the game's context as a result of player input. It's essential to create a playful narrative interaction that outlines what the player must do, how their choices and outcomes are depicted, and how these instances can be incorporated into the embedded storyline. Non-interactive sequences, or "cutscenes," are a series of events in which the player has no control over the game's environment. These sequences can be presented in text form, comic book style, 3D cinematic, animated or mixed sequences that include musical themes and sound

effects. The purpose of these "cutscenes" is to highlight important moments in the game, emphasize significant events, facilitate transitions between stages and scenarios, display the results of player choices, regulate the pace of the game, and provide information about the interaction and resources available in each setting.

The mechanics of a game establish the framework for its development, while the context or storyline influences the selection of mechanics by the designer. According to Teixeira (2017, p. 265), there is no one-size-fits-all approach to crafting a game script. It is crucial to understand the essential components of an imaginative and effective script, which include:

> - History: the story itself, based on conflicts;
> - Plot or plot (*plot*): it is the sequence of conflicts, the logical organization of this sequence being fundamental;
> - Scenes: situation space-time;
> - Characters: you must create the basic facts and their dimensions;
> - Dialogue: speech of the characters;
> - Emotional action: overcoming conflicts through the player's action;
> - Physical action: space-time shifts to resolve conflicts (TEIXEIRA, 2017, p. 265).

The writer asserts that in instructional games, the storyline carries equal significance to the mechanics, aesthetics, technology, and other elements, and must be integrated harmoniously.

One aspect of games, even those designed for education, is their interactive nature and the development of embedded and emerging storylines. The creation of these storylines is achieved through interactivity, which is crucial in attaining the goals of significant learning.

Composing educational games involves crafting an interactive narrative. Simply including game elements will not suffice if the story lacks interactivity. Therefore, it is crucial to understand how to create interactive stories when designing educational games. According to Lacombe (2019), whether writing an interactive story, soap opera, or screenplay, one should begin with the conclusion. Interactivity entails multiple endings and diverse routes to reach them, resulting in a customized experience for the player and a cohesive narrative. The initial step is to conceive the story idea and then envision potential endings.

A good beginning is to envision at minimum two potential conclusions, hinged on the conflict component, one for the protagonist's triumph and the other for their downfall (or demise). Proposing various routes to achieve these conclusions is a method of creating interactive storylines that depend on the so-called rules of the game, or, as previously mentioned, the mechanics of the game. The ensuing steps involve outlining the degrees of these conclusions based on the player's choice (mechanics). From this stage, the author leads the player's decisions and anticipates future prospects. Based on the criteria of envisioned choices, a web of rational resolutions is formed with assorted possibilities of endings.

These interlocking systems of connections establish the rationale of the integrated plot and the rational arrangement of the game. Concerning the configuration of the game, storylines may take the shape of a tree (with binary options) or of a spider's web, where some choices result in multiple outcomes. It is vital to prevent the danger of an excessive number of endings. The key to a well-crafted narrative is a stable world (with rules and mechanics) and well-developed characters. Inconsistency between the world, rules, and characters leads to a pointless and unengaging interactive tale. It is crucial to note that educational stories must always have a connection to reality, with the objective of creating genuine significance and effective learning.

Lacombe (2019) emphasizes the significance of regulations in a participatory narrative, referring to them as game guidelines. These guidelines are associated with the world, whether actual or imaginary. It is noteworthy that the type of game itself determines the mechanics and some fundamental regulations. The definition of the genre must always align with the interactive narrative being conveyed. It is essential to maintain coherence and equilibrium between choices and story conclusions. Creating various endings by designing these paths is the process of crafting an interactive narrative. There is a fascinating connection between planning and composing narratives, as well as a close association between designing educational content and creating educational games. This blueprint serves as a roadmap for the educational aims of the undertaking.

As the universe of the game is defined by the genre, it is possible to mix and match different game genres, seeking greater fun and different engagements and experiences. By incorporating mini-games into the storyline, players can extend their immersion in the game and alleviate the pressure of constantly making decisions. Maintaining coherence between codes and game mechanics is crucial for successful gameplay. Additionally, constructing dialogues that prompt either conversation or action (decision-making) is essential. Dialogues can be used to provide information or hints about game rules and mechanics, or to incite players to take action, make decisions, or choose a path.

Regarding options in interactive narratives, Lacombe (2019) categorizes three distinct kinds of options. Behavioral options address the player's ethical standards, conversational options enable you to personalize the gameplay, and Aptitude options empower you to cultivate analytical skills. All of these option types can be integrated into a nested storyline and have an impact on how game and educational objectives are attained. Options are pivotal for interactivity and are accountable for the captivating and absorbing influence.

Continuing the focus on interactivity for engaging learning, Sanches (2017) explored the impact of competition and cooperation on educational games. The findings indicate that educational games involve a delicate balance between competition and collaboration. However, when designed to foster collaboration amongst players, they facilitate deeper and more significant learning experiences. The significance of collaboration lies in the fact that fellow players serve as a valuable source of feedback, enhancing social and emotional interactions, and promoting learning.

Every facet of communication needs to be taken into account during the game's development, particularly the feedback dialogues. Feedback is a crucial component of educational games. Johnson (2017, p. 121) describes it as "the act of informing players about the accuracy of their responses, with the aim of guiding them towards improved performance, motivation, and learning outcomes." Most feedbacks have four typical features, which include:

> 1- information about concept or procedure; 2- moment of *feedback* (immediately or at the end of the activity); 3- modality in which the *feedback* is presented (spoken or written); 4- adapted to the student's characteristics (prior knowledge or spatial ability). A point worth noting concerns the fact that the *feedback* presented in written and spoken form (text and sound) have better learning outcomes. According to the author, adding *feedback* to the game allows achieving better learning outcomes.

Every component of a game is crucial in creating a meaningful and unpredictable storyline. Nevertheless, it is essential to establish a consistent connection between the plot, mechanics, and feedback in an educational game. There are two models for choosing instructional material: the conventional approach and the unconventional approach, which will be elaborated upon in the following sections.

Traditional Instructional Model

Keeping in view the concepts and components of instructional games that have been developed so far, it is crucial to proceed with the discourse on a model of reference for designing educational games that connects the educational material, depicted by the learning goals, with the enjoyment of the game.

According to Silva (2020), a practical framework is presented for creating an educational game through a series of steps. Firstly, it is essential to determine the game's topic and educational objectives. Secondly, the audience's characteristics, such as their educational level and gender, should be considered. The game's genre should then be selected, which may include action, shooting, simulation, puzzle, or quiz. It is crucial to ensure that the game genre aligns with the learning objectives. The next step involves developing the storyline, characters, and setting for the chosen genre, along with writing cutscenes, dialogues, and game tips.

Every gaming genre has its particular mechanics that act as education tools. The dynamics determine the player's engagement with the mechanics in the game and how the storyline evolves, leading to an enjoyable and innovative learning experience. Employing a single mechanic may not suffice for effective learning outcomes. Therefore, incorporating multiple layers of distinct mechanics can be useful in achieving the desired results. One way to accomplish this is by introducing mini-games, akin to the concept of diverse microlearning genres, to construct an

engaging and varied plot. This approach simplifies the creation of educational games.

Biggs (2003) supplements the conventional framework by emphasizing the significance of congruence between pedagogy, learning outcomes, and evaluation. Learning outcomes should be formulated based on the knowledge and skills that students are expected to acquire through their engagement in activities or games, rather than simply outlining the teacher's responsibilities. Consequently, the learning objectives center on the student's learning, not the teacher's role in the instructional process. This concept is referred to as Constructive Alignment, which prioritizes student activities and evaluation content in order to create a positive learning cycle for the student.

The utilization of this concept in pedagogy that relies on electronic games has a positive influence on enhancing the standard of education and facilitating educators to assess students more effectively, thereby enabling formative evaluations rather than just summative ones. The writer, Biggs (2003), highlights that an evaluation that is not linked to the game activity may cause students to feel demotivated and frustrated. The harmonization between educational goals, educational mechanics, game mechanics, and appraisal is vital for boosting student participation and ensuring successful and pleasurable learning.

In relation to the educational goals, it is worth discussing the criteria for their selection. According to Eisner (2005a, p. 33-34), the educational goals can be associated with the curriculum or not, regardless of whether the education is formal or informal. He highlights the school's twofold function, which is "to assist individuals in acquiring expertise in the cultural instruments currently available and to assist them in expanding these tools in a manner that ensures the culture's sustainability in the future." To fulfill this twofold function, the educational goals are divided into two categories: instructional goals and expressive goals. One goal focuses on the present, while the other focuses on the future.

The learning outcomes are linked to the abilities and expertise gained by the learner following their involvement in a specific task or sport. Typically, these outcomes are derived from subjects and presented to students for a period of time

to comprehend. The learning outcomes are utilized in a projection model of educational program design, where the curriculum endeavors to anticipate and structure the learning results.

Expressive goals are distinct from instructional goals in that they do not entail the acquisition of specific skills or knowledge upon completion of the activity. The expressive intention is more suggestive than explanatory. The expressive objectives aim to reveal what was previously learned but will be further developed and enhanced. The outcome of learning in this case is uncertain and personal, not conforming to predetermined criteria.

In the conventional approach, there are some considerations regarding the gamification of content. Landers (2014) explains that the process of gamification, as defined by the Gamified Learning Theory (GLT), involves using game elements outside of the game context to influence learning-related attitudes and behaviors. This indicates that gamification does not directly impact learning, but rather serves as a means to encourage and motivate learning, acting as a facilitator of effective learning. Zaric (2021) illustrates this by stating that the narrative aspect of a game enables students to engage with the content for longer periods, thereby promoting more effective learning. However, he cautions that before selecting game elements, instructors must provide substantial and high-quality instructional content. This writer also emphasizes that the selection of instructional content should come before the selection of game elements.

Another vital element for the active learning process in games is co-action, defined by Slota (2017). Since narrative is a process of interaction between game and player, there is always the opportunity to*designers*, writers, readers and players to co-act. Co-action means joining efforts to write, design or produce a game in a shared way, with diverse worlds and perspectives. Co-action is also found in multiplayer games where they co-construct the game's emergent narrative together. This style of play has been identified as bringing greater social interaction, joint reflection, memorability (groups continue to share game resonances), and the creation of a “time to tell”, improving the assimilation of instructional content.

In this sense of co-action, many writers use the participatory research method, including the user or player from the moment of creation and production of the game's narrative, mechanics, and dynamics. According to Morais (2012, p.162), a participatory design "goes beyond simply asking users what they want from a game, which is tantamount to market research." The participatory design strategy enables a group of users to participate in the game creation process, allowing them to jointly develop the story, narrative, mechanics, and dynamics of the game. This approach also fosters greater interaction between players and instructors or designers, resulting in a more in-depth and elaborate exploration of the selected content. The author further notes that the participatory design approach employs basic techniques such as brainstorming and storyboarding (explained in more detail later).

Well, according to Eisner (2005a, p. 212), "what every instructor wants is to create educational activities that allow the participant to design it himself".

Alternative Instructional Model

The alternative model is part of the search for a solution to the various criticisms of the formulation of educational objectives in the construction of the curriculum and meaningful learning.

Eisner (2005a) asserts that the formulation of instructional objectives should come before the selection and arrangement of material. He emphasizes the significance of imagination in substantial learning, and highlights the creative aspect's function in introducing unpredictability to the curriculum's development or the subject to be taught. The learning process cannot logically anticipate the subjectivity and expressiveness of each learner. An imaginative curriculum that integrates the imagination of each individual must be designed using a non-restrictive model, which cannot be defined in advance, and learning outcomes cannot be predicted. The intuitive approach, which is responsible for innovations in the arts and sciences, can serve as an example of an imaginative curriculum.

The author argues that this method of curriculum development based on learning objectives has four limitations:

> 1- Extension and accuracy has not been verified empirically; 2- The relationships between the relevance of the subject and the definition of objectives were not discussed; 3- The use of educational objectives as a measurement standard is confused when they can only be used as a judgment criterion; 4- The relationship between means and ends is not clear when psychological conditions are included in the construction of the curriculum. (EISNER, 2005a, p. 22, our translation)

Due to these limitations, the idea of curriculum development being an artistic endeavor arises. The process of crafting this imaginative curriculum is comparable to "creating art," be it in the form of painting or science. According to Eisner (2005), the cultivation of critical thinking in the learning dynamic between teacher and student transforms the instructor into an artist, whether by utilizing artistic techniques in curriculum design or by recognizing the impact of learning on the student, much like the appreciation of a work of art. This discourse on educational objectives via the alternate model highlights the significance of imagination and narratives in learning and will lead us towards a different approach to crafting an interactive, engaging, and meaningful learning narrative within an educational game.

Egan (1989) presents his planning framework for education as an unconventional option to the conventional approach that is widely accepted by teachers and educators. Typically, teachers are trained to devise their lesson plans by initially identifying the learning goals, selecting the materials and content, followed by the methodology and assessment type. Egan (1989) contends that the prevailing or customary planning model is unsuitable for educational content development, as the definition of learning objectives serves as the sole criterion for the selection, development, and evaluation of the acquired knowledge. When implementing this model, teachers disregard the most valuable aspect of a curriculum – the imaginative and creative potential of students to transform the unknown into the known, to create their own interpretations and shared understanding of the subject, and to connect logic and emotions to construct meaningful and practical applications of the subject.

The author presents the key idea of his substitute model by characterizing stories as narrative modules (EGAN, 1989). Each module comprises an initiation, a

progression, and a conclusion. The initiation presents the primary challenge, the progression elaborates on the challenge, and the conclusion resolves the challenge. Stories aim to give a context to an issue and expound on potential resolutions, the conclusion signifies the decision for a resolution path.

A pedagogical framework centered on narratives establishes that the instructional session commences with a predicament and progresses towards exploring probable solutions leading to the resolution. Consequently, an anticipation is generated at the outset, which is fulfilled by the conclusion. This interplay between anticipation and fulfillment is the foundation for selecting educational material, particularly for young learners. The tempo of the narrative is contingent on the students' cognitive capacity to grasp abstract notions such as morality, perseverance, annihilation, heroism, etc.

The selection of the initial conflict holds great importance, however, the interplay between expectation and satisfaction determines the class structure initially grounded on the dichotomy of theoretical notions. These contrasting theoretical notions serve as the yardstick for the curation and arrangement of the course material, where the progression of the conflict is illustrated as the student matures in their comprehension of these opposing concepts, propelling the narrative forward. It is worth noting the intimate correlation between the conflicting abstract concepts implicated in the early stages of a story and the sentiments they elicit in the audience. Stories are fundamentally about evoking an emotional response in the audience, which can be attributed to the principle of expectation and satisfaction mentioned earlier. Narration is one of the avenues to infuse significance into the content. The teacher and students examine and elaborate on the context and details via analogies and metaphors.

Egan (1989, p. 41) presents the alternative model by applying the principles of storytelling, as follows:

> 1) Identify the importance of the content for its affective engagement;
> 2) Define the binomial-opposites that most represents the importance of the subject;
> 3) Organize the content in the form of a story, identify the conflict related to the binomial-opposites;

> 4) Conclude by grading the most suitable binary-opposites for the elaboration of a solution to the conflict;
> 5) Evaluate according to the abstract concepts represented by the binary-opposites, their gradations, affectivity and learned content.

Returning to the criteria for choosing content for educational games, Iuppa (2012, p. 54) emphasizes the importance of identifying tacit knowledge when writing a story for an educational game. Example by saying:

> Asking an experienced leader to talk about leadership can result in an inconclusive tangle of skills. However, asking to tell a story about leadership can bring more specific and enriching information. (IUPPA, 2012, p. 54)

The writer suggests commencing the story by defining two conclusions; one with a simplistic outlook and the other with a more informed and realistic perspective of the world. The additional endings will vary in degree and offer different interpretations of events.

Once the implicit knowledge is identified, the game scenarios can be represented by decision points and organized by theme. It is essential to have qualified personnel validate these decision points, who possess the knowledge that you seek to acquire. The author recommends that the initial decision in the game should be associated with the most significant instructional point of the subject, creating a close relationship between decision points and the degree of pedagogical significance.

If the player misunderstands the crucial decision point of the lesson, they can enlist the aid of a knowledgeable mentor to assist them promptly. This astute guide materializes within the game to steer the player in the correct direction and advance the game by providing pointers and supplementary details.

The author, Iuppa (2012), suggests that utilizing artificial intelligence systems to track a player's progress in a game can serve as a valuable learning tool. This is because it provides insight into errors and the consequences of instructional decisions. The use of AI engineering also enables the creation of a customized narrative for the player to review in the form of “cutscenes” after the game has ended, which can help them better understand their choices.

Additionally, the text emphasizes the importance of addressing deficiencies in a game's storyline. Decision points should be incorporated to raise awareness of performance issues and provide opportunities for overcoming them. It is crucial to remember that training is a key method for addressing deficiencies. Furthermore, socioemotional and cultural aspects can be integrated into decision points, such as those that help players deal with racism.

When discussing a narrative, one cannot avoid mentioning the characters involved. Iuppa (2012, p. 84) stresses the significance of developing characters that align with educational goals and complement the instructional decisions crucial for a significant learning experience. The focus should be on supporting characters, who can have an equitable presence in the plot, encouraging interaction with diverse individuals. Additionally, it is beneficial to include characters that embody various perspectives and cultural backgrounds, enabling players to explore the intricacies of real-life situations.

The educator or tutor may participate in the activity with a specific duty of organizing the learners and appraising their performance upon completion. It is crucial to highlight that the educational elements must coincide with the rest to ensure the assessment is trustworthy. Nonetheless, the most fitting appraisal in educational games is the developmental assessment, which covers educational, communicative, and societal factors. These developmental evaluations can be conducted independently or integrated into the game and ought to encompass a broad spectrum of components, from educational preferences to self-reflection facilitated by the game.

Instructional Techniques

In general, the primary technical aspects that must be addressed when creating a game consist of the aforementioned game components, including: narrative (selection, action, and conflict points), player interface (the manner in which the player interacts with the game and its mechanics), non-interactive segments like cutscenes or kinematics (such as initial tutorials), characters and their actions, game art (environments and design), and sound (music and dialogue or

instructional explanations). These components constitute what is known as gameplay, and necessitate attention to technical details utilizing quality equipment and applications, particularly for voice and non-interactive segments.

One of the most cutting-edge methods utilized in the creation and advancement of educational games is Augmented Reality (AR). This technology immerses users by overlaying images, text, and sounds onto a genuine setting through suitable devices. Poitras (2017) differentiates augmented reality from virtual reality, where the user is engrossed in a fabricated virtual environment, and from telepresence (videoconferencing), which creates the illusion of being present in an authentic environment.

Although these concepts share similarities, the applied technologies are gaining significant implications, particularly through their implementation in education and educational games. Some crucial characteristics of AR comprise the fusion of real and virtual media, interactivity with the environment through location and orientation sensors (e.g. GPS), and representation of the real environment overlaid with digital information. The amalgamation of the real environment with digital information enhances the user experience, such as displaying nearby restaurants or indicating distance when playing golf. Research is necessary to determine the effectiveness of learning with AR in educational games, both in formal settings like schools and informal environments like museums and cultural centers.

There is no one-size-fits-all format in game design, and the process of creating games, including educational games, requires the use of a wide variety of media in a variety of formats. As a standard, some authors recommend using the simplest and most common form, such as: B. Traditional Excel or Word for writing stories and game dialogue. Poitras (2017) points out that getting the job done requires having the right tools, but this is a very personal decision.

But it points to Excel as a tool for planning interactive stories. Choice nodes are available in various cells, often in a different color than the story path, and provide a general view of the story topology. Small cells in Excel promote brevity because players don't need long rows. Excel is also great for organizing dialogs for audio specialists. The author gives tips on how to work question by question or

scene by scene. The included worksheet helps separate different phases or levels within the same game. There are applications dedicated to creating games such as: B. Writer of Final Draft and Movie Magic. Some applications (engines) that create games only accept certain file formats when creating games, so it's always interesting to choose these apps along with design and game programming.

Lacombe (2019) shows the use of the Twine application for beginners, but the application is a conditional mechanism (when player selection can be made under certain conditions, such as accumulating lives or books). For professionals, there is Celesstory Creator that lets you introduce conditions via variable sboolean, digital, or text. Other tools recommended by the author are: Adrift, Inform, Conducttr, Chat Mapper and Inkle, and Articy Draft for integration with Unity.

Morais (2015) defines the storyboard tool as one of his most useful tools for game development, including educational ones. A storyboard is a tool for creating and visualizing scripts and stories, created for animated films and later extended to screenplays and films in general. The storyboards were used (as cutscenes) to convey information to the player beyond game development.

The script, represented in storyboard form, describes the flow of the game (how the player accomplishes his objectives) and the art used in the game, along with all information about his style and gameplay (i.e. example: life and available weapons). For storyboard creation, the author specifies the application StencylWorks. However, many other creators show his PowerPoint well known for creating initial sketches and gamified content.

It is inevitable not to comment on the famous *engines*, applications that produce the games, summarized by Wilson (2019) and BrasilCode, we have:

- Construct - 2D games, no programming required, for beginners.
- Game Maker - similar to *Construct* but with language
- GML (Game Maker Language).
- Godot - 2D and 3D Games,*open source* however it needs programming, GDScript.
- Unity - 2D and 3D games, requires programming in C#.
- Unreal - 2D and 3D games, programming in C++.

For teachers, instructors and instructional designers, the *Construct* seems to be the best solution, as it does not require programming knowledge. It makes it possible to create games in 2D and 3D, for various platforms and mobile devices, in addition to being very good for creating prototypes.

To see some of the educational and entertainment games in action, it is possible to watch some games on the YouTube channel, as players record the game screen and post it publicly. To exemplify, here is a small sample of games and their addresses:

Table 2 - Digital Games and their visualizations on Youtube

Educational Games	Youtube address
DinoLab	https://www.youtube.com/watch?v=vP67BEzW9j4
Were on earth is Carmen Sandiego?	https://www.youtube.com/watch?v=TJRMplV9SpA
Dr Kawashima's Brain Training	https://www.youtube.com/watch?v=vtjqyvh0QCY
MinecraftEdu	https://www.youtube.com/watch?v=7GWcOqXl0WA
entertainment games	Youtube address
10 best games of 2020	https://www.youtube.com/watch?v=PaJ4_Xu_jAc
LoL- League of legends	https://www.youtube.com/watch?v=e2YjDfej8iY
GTA - Gand Theft Alto	https://www.youtube.com/watch?v=8ne8h2bIRTw
Watch Dogs	https://www.youtube.com/watch?v=7RZxGSypM1w&list=PLs1-UdHIwbo7XYvhJXQBnxpW76f5hCNIl
Fortnite	https://www.youtube.com/watch?v=eVUH6z71R8g

FIFA	https://www.youtube.com/watch?v=edV0KesM5xI

(Self elaboration)

Watching games on YouTube is exciting and promotes unstructured knowledge about gaming in general. This is necessary to understand current game mechanics and gameplay. In general, there are many tools on the market that can be used to create educational games. Using the Google and YouTube search engines to access tutorials will guide you on this journey.

Final considerations

Educational games are created in formal and informal educational settings such as schools, museums and cultural centers. There is still a long way to go before learning games are integrated into lessons and positive teaching methods. Creating educational games is a complex task that requires building multiple game elements and aspects. And most importantly, the consistency of lesson content, gameplay, and assessment.

This article describes standard educational methodologies for defining learning objectives and alternative approaches to storytelling as content selection applied to educational games. It is interesting to note that this article was written using an alternative teaching approach. In this approach, he first identifies two polarizing subjects and then creates a gradation between this polarization. That is, it has been guided by a polarization between conventional and alternative methods.

It's intuitive that there are a multitude of gradations and possible combinations between these two approaches, and creativity and lessons are fundamental to combining them. Both concepts can be included in the broader art of gamification, and games can be created using either or only parts of each of the two theories. Games can have well-defined lesson objectives and can be built using a storytelling methodology that incorporates both into the game design. It doesn't get any better than that. Addressing both educational and expressive learning goals

is attractive because expressive learning goals contribute significantly to the unpredictability of meaningful instruction.

The game's technical tools are also very intuitive and need constant learning to facilitate the creation and design of educational games.

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